Claims

1. A thermal combustion engine (1, 1', 1", 51, 51', 51") for converting thermal energy into mechanical energy, comprising at least one vapor generation device (11a, 11a', 11a", 13, 13', 61a, 61a', 63, 63') for at least partially vaporizing a first liquid working medium (21, 21', 73, 73') using thermal energy supplied to the thermal combustion engine (1, 1', 1", 51, 51', 51"), at least one rotor (11, 11', 11", 61, 61', 61"), which is drivable using the vaporized first working medium (21, 21', 73, 73') to generate mechanical energy and is rotatable in relation to at least one stator (3, 3', 3", 53, 53', 53") around at least one axis of rotation, and at least one condensation device (11c, 11c', 11c", 15, 15', 61c, 61c', 65, 65', 65") for condensing the vaporized first working medium (21, 21', 73, 73') after driving the rotor (11, 11', 11", 61, 61', 61"), the rotor (11, 11', 11", 61, 61', 61") essentially completely surrounding the stator (3, 3', 3", 53, 53', 53") and the rotor (11, 11', 11", 61, 61', 61") essentially completely enclosing the vapor generation device (11a, 11a', 11a", 13, 13', 61a, 61a', 63, 63') and the condensation device (11c, 11c', 11c", 15, 15', 61c, 61c', 65, 65', 65").

2. A thermal combustion engine (1, 1', 1", 51, 51', 51", 101, 101', 101") for converting thermal energy into mechanical energy, comprising at least one vapor generation device (11a, 11a', 11a", 13, 13', 61a, 61a', 63, 63', 115, 115', 115") for at least partially vaporizing a first liquid working medium (21, 21', 73, 73', 137) using thermal energy supplied to the thermal combustion engine (1, 1', 1", 51, 51', 51", 101, 101', 101"), at least one rotor (11, 11', 11", 61, 61', 61", 117, 117', 117"), which is drivable using the vaporized first working medium (21, 21', 73, 73', 137) to generate mechanical energy and is rotatable in relation to at least one stator (3, 3', 3", 53, 53', 53", 103, 103', 103") around at least one axis of rotation, and at least one condensation device (11c, 11c', 11c", 15, 15', 61c, 61c', 65, 65', 65", 107, 107', 107") for condensing the vaporized first working medium (21, 21', 73, 73', 137) after driving the rotor (11, 11', 11", 61, 61', 61", 117, 117', 117"), the

rotor (11, 11', 11", 61, 61', 61", 117, 117', 117") at least partially surrounding the stator (3, 3', 3", 53, 53', 53", 103, 103', 103").

3. The thermal combustion engine according to Claim 2,
characterized in that the rotor (11, 11', 11", 61, 61', 61", 117) essentially completely surrounds the vapor generation device (11a, 11a', 11a", 13, 13', 61a, 61a', 63, 63', 115) and/or the condensation device (11c, 11c', 11c", 15, 15', 61c, 61c', 65, 65', 65").

4. The thermal combustion engine according to Claim 2 or 3,
characterized in that the stator (103, 103") essentially completely surrounds the vapor generation device (115) and/or the condensation device (107, 107').

5. The thermal combustion engine according to Claim 2,
characterized in that the vapor generation device (115") and/or the condensation device (107") is/are implemented in at least two parts and the rotor (117") surrounds a first part of the condensation device (107a") and/or a first part of the vapor generation device (115a") and the stator (103") surrounds the other part of the vapor generation device (115b") and/or the condensation device (107b").

6. The thermal combustion engine according to one of Claims 1 through 5,
characterized by at least one first chamber (13, 13', 63, 63', 129, 129', 129") forming the vapor generation device,
at least one second chamber (15, 15', 65, 65', 65", 131, 131', 131") forming the condensation device, and
at least one turbine chamber (25),
the first chamber (13, 13', 63, 63', 129, 129', 129") and the second chamber (15, 15', 65, 65', 65", 131, 131', 131"), the first chamber (13, 13') and the turbine chamber (25, 25'), and/or the second chamber and the turbine chamber being at least partially separated from one another using a thermally insulating wall (17, 17', 17", 23, 24', 69, 69', 85, 85', 85", 121) in particular.

7. The thermal combustion engine according to Claim 6,
characterized by at least one first connection device, which connects the first chamber (13, 13', 63, 63') and the turbine chamber (25, 25') for passage of the vaporized first working medium (21, 21', 73, 73'), preferably comprising at least one first nozzle (27, 27', 27", 77, 77', 77", 139), the geometry and/or the orientation of the nozzle opening preferably being adjustable, at least one first pipe (75, 75', 75") and/or at least one first opening, particularly implemented in the thermally insulating wall.

8. The thermal combustion engine according to Claim 6 or 7,
characterized by at least one second connection device, which connects the turbine chamber and the second chamber for passage of the vaporized first working medium, preferably comprising at least one second nozzle, the geometry and/or the orientation of the nozzle opening preferably being adjustable, at least one second pipe, and/or at least one second opening, particularly implemented in the thermally insulating wall.

9. The thermal combustion engine according to Claim 7 or 8,
characterized by at least one first flow control and/or regulation device, which is operationally linked to the first connection device, and/or at least one second flow control and/or regulation device, which is operationally linked to the second connection device, preferably in the form of a first and/or second valve.

10. The thermal combustion engine according to one of Claims 6 through 9,
characterized by at least one third connection device, which connects the first chamber (13, 13') and the turbine chamber (25, 25') for passage of the liquid first working medium (21, 21'), particularly in the form of a third opening (19, 20'), preferably implemented in the thermally insulating wall (17, 17').

11. The thermal combustion engine according to one of Claims 6 through 10,

characterized by at least one fourth connection device, which connects the turbine chamber and the second chamber for passage of the liquid first working medium, preferably in the form of at least one fourth opening, which is particularly implemented in the thermally insulating wall.

12. The thermal combustion engine according to Claim 10 or 11, characterized in that the liquid first working medium (21, 21', 73, 73') prevents the vaporized first working medium (21, 21', 73, 73') from exiting the first chamber (13, 13', 63, 63', 129, 129', 129") through the third and/or fourth connection device during a rotation of the rotor (11, 11', 11", 61, 61', 61", 117, 117', 117"), particularly blocks the third and/or fourth opening (19, 20'), particularly because of the centrifugal force acting on the working medium (21, 21', 73, 73', 137).

13. The thermal combustion engine according to one of Claims 10 through 12, characterized by at least one third flow control and/or regulation device, which is operationally linked to the third connection device, and/or at least one fourth flow control and/or regulation device, which is operationally linked to the fourth connection device, preferably in the form of a third and/or fourth valve, particularly a check valve.

14. The thermal combustion engine according to one of Claims 6 through 13, characterized in that the second chamber (15, 15') and the turbine chamber (25, 25') are molded in one piece.

15. The thermal combustion engine according to one of Claims 6 through 14, characterized by at least one flow guiding body (14', 16') implemented in the first chamber (13'), the second chamber (15'), and/or the turbine chamber (25').

16. The thermal combustion engine according to one of the preceding claims,

characterized by at least one first blade wheel (7, 7', 7", 57a, 57a', 57a", 109), surrounded by the stator (3, 3', 3", 53, 52', 53", 103, 103', 103"), to which the vaporized first working medium (21, 21', 73, 73', 137) may be supplied, preferably via the first connection device (27, 27', 27", 75, 75', 75", 77, 77', 77", 139), for rotating the rotor (11, 11', 11", 61, 61', 61", 117, 117', 117") relative to the stator (3, 3', 3", 53, 53', 53", 103, 103', 103"), particularly axially, radially, and/or at a predefined angle in relation to the first axis of rotation.

17. The thermal combustion engine according to Claim 16,
characterized by at least one flow guiding wheel (8", 125), which is operationally linked to the rotor (11", 117, 117', 117"), particularly connectable thereto for secure rotational driving, and is positioned upstream and/or downstream of the vaporized working medium (21', 137) in relation to the first blade wheel (7", 109), the flow guiding wheel (8", 125) being positioned at least partially concentrically to the first blade wheel (7", 109), particularly inside and/or outside the first blade wheel (7", 109).

18. The thermal combustion engine according to Claim 16 or 17,
characterized by at least one second blade wheel (57b, 57b', 57c', 57b", 57c", 111), which is surrounded by the stator (53, 53', 53", 103, 103', 103") and is particularly positioned downstream of the vaporized working medium in relation to the flow guiding wheel, at least one deflection wheel (79a, 79b, 79a', 79b', 79c', 79a", 79b", 79c"), which is operationally linked to the rotor (61, 61', 61"), particularly connectable thereto for secure rotational driving, preferably being positioned upstream and/or downstream of the vaporized working medium (73, 73') in relation to the second blade wheel (57b, 57b', 57b", 57c', 57c"), the deflection wheel particularly being positioned at least partially concentrically to the first and/or second blade wheel, particularly inside and/or outside the first and/or second blade wheel.

19. The thermal combustion engine according to one of Claims 16 to 18,

characterized in that the first blade wheel (7, 7', 57a, 57a', 57a"), the flow guiding wheel, the second blade wheel (57b, 57b', 57c', 57b", 57c"), and/or the deflection wheel (79a, 79b, 79a', 79b', 79c', 79a", 79b", 79c") are at least partially positioned in the turbine chamber (25, 25').

20. The thermal combustion engine according to Claim 18 or 19, characterized in that the second blade wheel has a second diameter deviating from a first diameter of the first blade wheel and/or a number and/or geometry of the blades deviating from the number and/or geometry of the blades of the first blade wheel.

21. The thermal combustion engine according to one of Claims 18 to 20, characterized by multiple second blade wheels (57b', 57c', 57b", 57c") and/or deflection wheels (79a, 79b, 79a', 79b', 79c', 79a", 79b", 79c"), the second blade wheels (57b', 57c') preferably having different diameters, different geometries, and/or a different number of blades from one another and/or the deflection wheels (79a', 79b', 79c') having different diameters, different geometries, and/or a different number of blades from one another.

22. The thermal combustion engine according to one of Claims 16 to 21, characterized in that the geometry and/or the position of at least one blade of the first blade wheel, of at least one second blade wheel, of the flow guiding wheel, and/or of at least one deflection wheel is/are adjustable, preferably during operation of the thermal combustion engine.

23. The thermal combustion engine according to one of the preceding claims, characterized by at least one heating means for applying heat to the vapor generation device (11a, 11a', 11a", 13, 13', 61a, 61a', 63, 63', 115, 115', 115", 129, 129', 129"), particularly the first chamber (13, 13', 63, 63', 129, 129', 129"), preferably in the form of a fluid heating medium, particularly in the form of hot gases, such as combustion gases (29, 29', 71, 71', 135), a heat source, for example,

in the form of at least one heating spindle, which is integrated in a wall of the first chamber, which particularly comprises a material of high thermal conductivity and/or is structured for high conductive thermal transport, and/or is implemented on the surface of this wall, at least one first flow device for a heating fluid (29, 29', 71, 71', 135), at least one first structure, which is implemented on an outside of the wall (11a, 11a', 11a", 61a, 61a', 115, 115', 115") of the first chamber (13, 13', 63, 63', 129, 129', 129") and may particularly have the heating fluid (29, 29', 71, 71', 135) flow through it, and/or at least one second structure, which is implemented on an inside of the wall (11a, 11a', 11a", 61a, 61a', 115, 115', 115") of the first chamber (13, 13', 63, 63', 129, 129', 129") and may particularly have the preferably vaporized working medium (21, 21', 73, 73', 137) flow through it.

24. The thermal combustion engine according to Claim 23,
characterized in that the first flow device is integrated in the wall, the heating means preferably being supplied to the first flow device via a shaft of the stator and/or the heating means particularly being circulated in a preferably closed heating loop which comprises the first flow device.

25. The thermal combustion engine according to one of the preceding claims,
characterized by at least one coolant to apply cold to the condensation device (11c, 11c', 11c", 15, 15', 61c, 61c', 65, 65', 65", 107, 107', 107", 131, 131', 131"), particularly the second chamber (15, 15', 65, 65', 65", 131, 131', 131"), preferably in the form of a fluid cooling medium, particularly in the form of nitrogen or cold air (31, 31', 81, 81', 141), a cooling source, for example, in the form of at least one Peltier element, which is particularly implemented in a wall of the second chamber, which preferably comprises a material of high thermal conductivity and/or is structured for high convective heat transport, and/or is implemented on the surface of this wall, at least one second flow device for a cooling fluid (31, 31', 81, 81', 141), such as nitrogen or cold air, at least one third structure, which is implemented on an outside of the wall (11c, 11c', 11c", 61c, 61c', 107, 107', 107") of the second chamber (15, 15', 65, 65', 65", 131, 131', 131") and may particularly

have the cooling fluid (31, 31', 81, 81', 141) flow through it, and/or at least one fourth structure, which is implemented on an inside of the wall (11c, 11c', 11c", 61c, 61c', 107, 107', 107") of the second chamber (15, 15', 65, 65', 65", 131, 131', 131") and may particularly have the working medium (21, 21', 137) flow through it.

26. The thermal combustion engine according to Claim 25, characterized in that the second flow device is integrated in the wall, the coolant preferably being supplied to the second flow device via a shaft of the stator and/or the coolant particularly being circulated in a preferably closed cooling loop which comprises the second flow device.

27. The thermal combustion engine according to one of Claims 23 through 26, characterized in that the heating fluid (29, 29', 71, 71') has a flow direction in the area of the heating means which runs essentially radially outward from the first axis of rotation to the external circumference of the rotor (11, 11', 11", 61, 61', 61"), and/or the cooling fluid (31, 31', 81, 81') has a flow direction in the area of the coolant which runs essentially radially from the outer circumference of the rotor (11, 11', 11", 61, 61') in the direction of the first axis of rotation.

28. The thermal combustion engine according to one of the preceding claims, characterized by at least one supply device for supplying at least one vaporized second working medium, the first and second vaporized working media preferably being identical.

29. The thermal combustion engine according to one of the preceding claims, characterized by at least one removal device for removing at least a part of the vaporized and/or liquid first working medium.

30. The thermal combustion engine according to Claim 28 or 29,

characterized by at least one fifth flow control and/or regulation device, which is operationally linked to the supply device, and/or at least one sixth flow control and/or regulation device, which is operationally linked to the removal device.

31. The thermal combustion engine according to one of the preceding claims, characterized by at least one control and/or regulation unit, which is operationally linked to the vapor generation device, the condensation device, the first and/or second nozzle of the first, second, third, fourth, fifth, and/or sixth flow control and/or regulation device, the first blade wheel, at least one second blade wheel, the flow guiding wheel and/or at least one deflection wheel, the heating means, the cooling means, and/or a sensor for measuring the rotational velocity of the rotor.

32. A use of a thermal combustion engine according to one of the preceding claims as a topping turbine, exhaust vapor turbine, back pressure turbine, extraction turbine, impulse turbine, and/or reaction turbine.